

Sanitized Copy Approved for Release 2011/04/11 : CIA-RDP81-00280R000200130030-9

STAT

Next 1 Page(s) In Document Denied

Sanitized Copy Approved for Release 2011/04/11 : CIA-RDP81-00280R000200130030-9

TELECOMMUNICATION AND VACUUM TECHNOLOGY IN HUNGARY

A Magyar Tudomány Tíz Éve
1945-1955 /Ten Years of
Science in Hungary 1945-1955/,
1955, Budapest, Pages 319-322

Geza Bogнар, Tivadar Millner
and Erno Winter

A significant telephone and circuitry industry developed in Hungary in the period between the two world wars, but most of the equipment was manufactured on the basis of foreign documentation and there was little possibility for individual development. After Liberation the small number of telephone engineers was tied down with the work of the reconstruction of the destroyed telephone centers and the planning of the large-scale expansion of the telephone network.

Following the completion of these tasks Erno Acs developed an important new telephone switching apparatus which incorporates electronic elements, and is quite different from previous types of similar apparatuses.

The new features of this switching apparatus are its previously unparalleled 1,000-incoming-line capacity, optical control of the apparatus, and the weld-less execution of the apparatus' switch banks (multiplication). The Beloiannis Communications Technology Plant now is preparing a 600-line prototype of this new system which is to be marketed commercially. The advantages of the new switching apparatus are that it has a higher factor of continuous operation and it costs considerably less to manufacture than older types. Furthermore, the 1,000-line apparatus ensures much greater exploitation of the trunk lines connecting the main telephone centers, which is another great economic advantage.

The domestic transmission industry was founded on the basis of foreign documentation. Very few researchers were active in the field of the science of transmission technology prior to Liberation. Ivan Tomits ranks first among the latter, who did some very valuable instructional work and turned out some very important research work, as well.

There was a relatively strong development in the field of transmission technology in the years following Liberation. The regular instruction of transmission technology in universities was begun and many original Hungarian and many translated, primarily Soviet, technical books were published in this field. With the development of new export-quality equipment the transmission technology industry became an important factor in Hungary's export trade.

The most important development in this field was the production of a 12-channel telephone transmission system which was developed through collective research work at the Beloiannis Plant. The new equipment enables 12 telephone conversations to be carried simultaneously by a single 4-wire circuit of the transmission cable. The importance of this development is indicated by the fact that the use of a single 12-channel system over a 200-kilometer circuit results in the saving of approximately 30 tons of copper cable.

The Hungarian telecommunications industry began work on microwave transmission after the Liberation. Microwaves are especially suitable for the simultaneous transmission of many conversational channels and television programs. Not long after Liberation research and development work was begun on an impulse-modulation multiple-channel microwave system

STAT



at the Postal Experimental Station, and later at the Telecommunications Research Institute (Geza Bogner and his associates (Ed.)). Utilizing the results of this research the Beloiannis Telecommunications Plant later produced a prototype of a 24-channel system. Because this type of equipment needs no transmission cable or aerial transmission line it results in a considerable saving in nonferrous metals and the production costs of this type of communication circuit is much lower than that of previous types. With the use of intermediary relay stations this system is suitable for long distance transmission.

The first task in the field of radio following Liberation was the reconstruction of the broadcasting network, which had suffered extensive damage during World War II. Because the previous foreign connections had been severed the radio industry had to solve the problems of its further development through its own resources. The developmental work at the Beloiannis Telecommunications Plant produced 3 outstanding achievements:

A high-output, forced-air-cooled 25 kw medium frequency radio transmitter was developed, which is the first such instrument manufactured in Hungary. The driving stage of the modulator of this transmitter is connected to the cathode, which results in a considerable increase in transmission efficiency and a decrease in distortion.

A 135 kw medium frequency transmitter was developed, in which domestic research has incorporated a high-tension, gas-filled, remote-controlled rotating condenser for the tuning of the final stage, and the high-output tubes are fed by alternating current in a manner that the noise level meets the international requirements.

The prototype of a 120 kw short wave transmitter which was developed entirely by domestic research is nearing completion. This instrument may be continuously remote controlled throughout the entire short wave range. This transmitter has a cathode-connected modulator-driving stage. The circulating water is cooled by a new method of heat exchange utilizing an axial ventilator instead of the usually radial ventilator. This new design also resulted in a considerable decrease in the dimensions of the equipment. This equipment was produced primarily to satisfy the needs of export trade. Another new feature of this transmitter is that the feed line may be switched over from the transmitting station by remote control and by a feed-back system.

As a result of research at the Telecommunications Research Institute certain new theoretical relationships were established which considerably modify certain concepts concerning the absorption of radiation previously accepted in classical physics and eliminate existing contradictions in the literature. On the basis of the new principles the directional receiving antennas may be directly calculated from the wave equation. Edwin Istvanffy stated these results in his work entitled A vetel mechanizmus iranyított antennaknal /The Mechanism of Reception in Directional Antennas/.

The uninterrupted functioning of telecommunication equipment depends primarily on the quality of the materials and parts used in its construction. Prior to Liberation high quality parts were imported from abroad. The major development of the domestic manufacture of high quality parts began in the early 1950's.

The iron dust used in the production of pulverized iron cores previously had to be imported, but increasing difficulties were encountered in the importing of this material. Peter Denes, at the Telecommunications

STAT



Research Institute, developed a type of electrolytic pulverized iron from which better pulverized iron cores could be manufactured, than from the types of electrolytic pulverized iron mentioned in the foreign literature. On the basis of this research the Telecommunications Materials Plant was built, which applied the developed technology to mass production methods. Thus, in the future the import of most of the pulverized iron may be eliminated, and the pulverized iron cores of filter coils may be produced from domestic pulverized iron.

In addition to magnetic substances, very pure germanium metals have been successfully produced from domestic materials.

The average international level has been equalled in the production of silicon crystals and crystal diodes. Domestic research also has begun in the field of ferrite substances. Ferrite equal to the international quality standards has been successfully produced from chemically pure basic substances.

The importance of tungsten research in vacuum technology is well known. Since the time when Just and Haneman produced the first tungsten-filament incandescent bulb in Hungary, tungsten research has been a central problem of the vacuum technology industry. Beginning in 1923 extensive research has been conducted on the investigation and development of the useful properties of metallic tungsten. This work led to numerous important developments of international importance. Tungsten research, which was interrupted by wartime conditions, was begun anew after Liberation.

The research was conducted along 2 major lines. Tungsten wire consisting of large crystals are being used to achieve a high hot and cold hardness of the incandescent bodies. The attainment of this type of crystalline structure required small amounts of alloying substances, which increased the difficulty of working the metallic tungsten. One of the main lines of research was the attainment of a favorable crystalline structure with much less alloying substances than previously used. The other line of research involved the perfection of the reduction of tungsten (production of pure tungsten from a tungsten salt). Both lines of research resulted in significant achievements (primarily the work of Tivadar Millner and Jeno Neugebauer (Ed.)). Modification of the manufacturing technique resulted in a considerable increase in the workability of metallic tungsten, the new manufacturing method proved to be much more economical, and the uniformity and quality of the very fine tungsten wire used primarily in the manufacture of radio tubes, improved beyond all expectations.

The above research enabled Hungary to take the lead in the world market in the production of incandescent bulbs which are exposed to extraordinary vibration.

The domestic processing of Chinese Wolframite ore, and the development of factory methods for the production of very high quality metallic molybdenum also are worthy of mention.

Hungarian technical science was engaged in research on the development of electronic tubes even before Liberation, and the electronic tubes produced by the barium metallic vapor reduction method helped place Hungarian industry in a leading international role in this field.

Following Liberation research was focused on the further development and improvement of the properties of oxide cathodes. The research work was extended to both the metallic core and emission layer of the oxide cathodes. In the course of this research it was estimated that,

STAT



contrary to the opinion long held in foreign literature, the presence of silicon in the metallic core of the oxide cathode is not beneficial, but is harmful.

It was known that the oxide layer of the cathode was rapidly consumed at high temperatures or at high current density. In the course of this research an oxide layer was developed which could endure high temperatures without changing (Erno Winter and his associates (Ed.)). This method has substantial advantages over the earlier oxide cathodes.

The practical application of the new emission substance was primarily in battery tubes, which enabled a decrease of approximately 50% in the heat output of these tubes over comparable foreign tubes. This has great practical significance, because sets equipped with the Hungarian battery tubes can be operated with considerably less battery power, or at the same battery power the life of the battery is increased approximately 3-fold. This is of great importance from the point of view of the set. Because of the new emission layer the life of the Hungarian tubes is longer than that of foreign tubes with 50% greater heat output. The under-heating ability of these tubes also is superior. The new emission material also is important to export trade, and the Hungarian electronic tube industry exports large numbers of battery tubes.

The new oxide cathode also may be used advantageously in photoelectric tubes. The life of these tubes is 2 to 3 times longer than that of photoelectric tubes utilizing other types of oxide cathodes.

Gyorgy Szigeti and his associates have conducted extensive and basic research on the physical properties of semiconductors. The results of their research on the lighting substances of photoelectric cells have received acclaim abroad.

Successful research also has been performed in the field of cathode ray tubes, which formed the basis for the domestic production of television and cathode ray oscillograph tubes on a par with the world market products. The research on luminescent shadow substances and on the properties of glass also played an important role in the latter development.

* * *